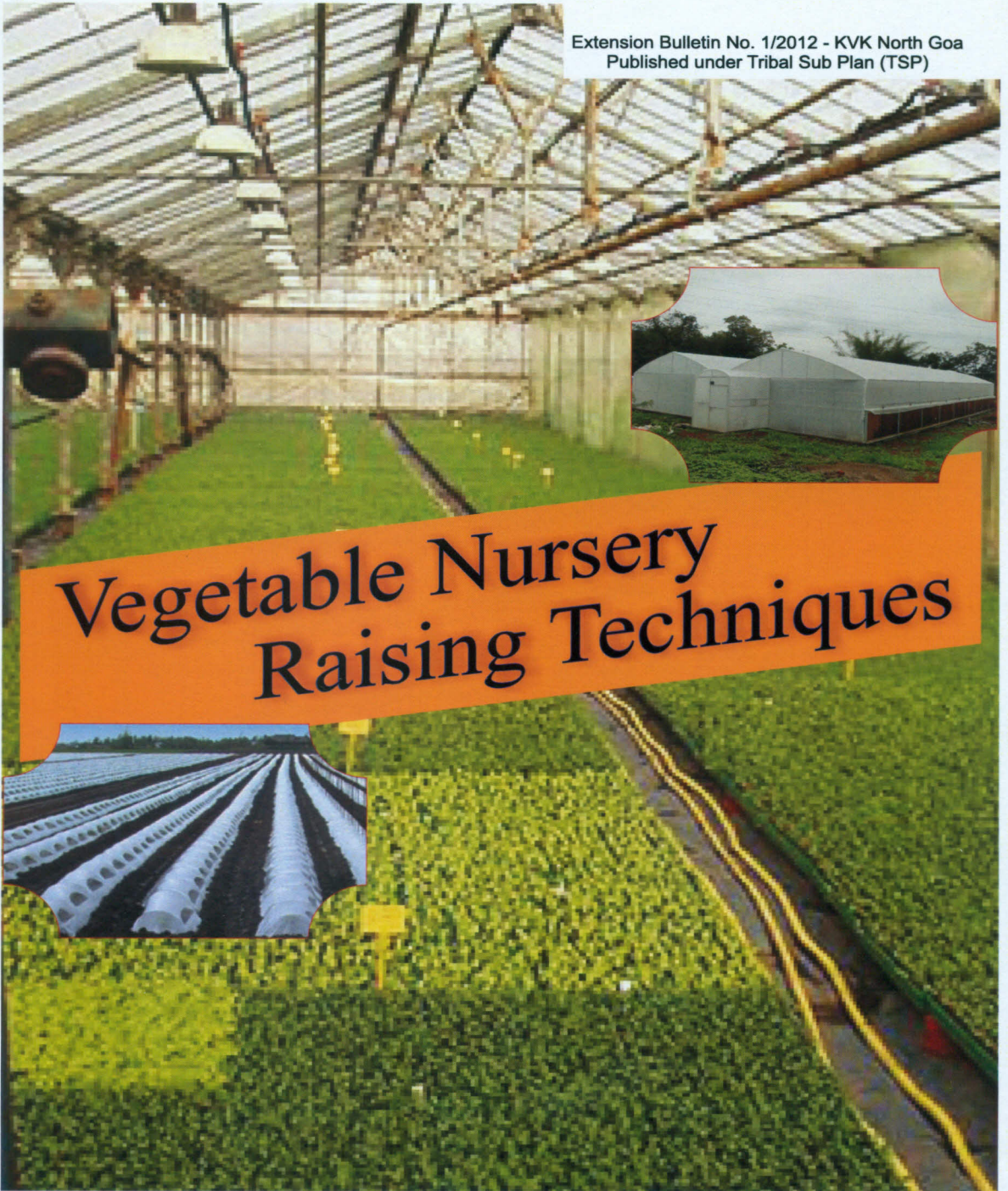


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# Vegetable Nursery Raising Techniques



**Krishi Vigyan Kendra**

ICAR Research Complex for Goa  
(Indian Council for Agricultural Research)

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# Vegetable Nursery Raising Techniques

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# Foreword

India is the second largest producer of vegetables with an estimated production of 146.55 m.t. from 8.49 million ha. Due to change in food habit and increasing health consciousness, the demand of vegetables is increasing day by day. Our countrymen not getting required vegetables (300 g/caput/day) as recommended by ICMR. On an average we are able to supply only 200 g of vegetables day caput. In order to fulfill the demands of the country's people, there is an urgent need to increase the production and productivity of vegetable crop, more importantly quality vegetables. The deficit of this 100 g vegetables has attracted the attention of the planners, researchers, extension personnels, vegetable growers and processors.

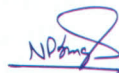
The average national and Goa state productivity of vegetables is 17.30 to 10.00 t/ha respectively which is far below than many developed and developing countries. There may be many reasons for low productivity, but it is mainly due to use of poor quality seed and low yielding varieties, poor management practices, unscientific cultivation, etc; more importantly unawareness about technical knowhow especially in case of quality seed and planting material production.

The seeds of many vegetables such as brinjal, chilli, onion, knolkhol, cabbage, cauliflower, tomato, capsicum, cucumber, bottle gourd, etc. are firstly sown in nursery beds/portrays/polybags to raise seedlings and then transplanting them in main field generally after 25-30 days of seeds sowing except onion which takes 42-56 days to transplant.

Raising the quality seedlings is an specialized technique which require skill and technical knowhow. Good seeds and seedlings give better field stand and abundant yield. Quality seed and seedlings in proper management conditions are able to increase 20-25 percent yield. Thus, the production of quality seed and seedlings are of paramount importance for increasing the yield potentials and meeting the ever increasing demands of vegetables at reasonable prices, generating additional income, creating more employment opportunities for both rural and urban youth and women folk.

This extension bulletin "Vegetable Nursery Rasing Techniques" intends to be better guide and may be of great utility to the extension worker, vegetable growers, seed and seedling growers, besides unemployed youth and other stakeholders who intend to make vegetable seedling production as a business and the farming community as a whole who directly and indirectly are engaged in vegetable crop, seed and seedlings production and are responsible for vegetable industry.

I appreciate rather congratulate Dr. Raj Narayan, Programme Coordinator/Senior Scientist, Krishi Vigyan Kendra, ICAR Research Complex for Goa for his keen interest and hard work in bringing this manuscript of immense value for all interested in basic principles and technical knowhow of vegetable seedling production, which will be of great use to all connected with the field in one way or the other.



**(N.P. Singh)**  
**Director**



# Preface

In late 60s India witnessed green revolution and has now attained food security by increased cereal production. But in vegetable production our country is far behind, although there has been spectacular increase in production from 15 million tonnes in 1950 to 146.55 million tonnes at present placing the country at second place after China in vegetable production. In order to fulfill the requirement of 300 g vegetables/day/capita and also to meet the demand for fresh, export and processing industries, there is an urgent need to increase the production and productivity of vegetables through various means such as use of high quality seeds of improved varieties and hybrids, following hi-tech production and protection technologies and more so by going to quality seeds and seedlings production as these form the foundation stone of bumper harvests. The small seeded vegetable crops like brinjal, chilli, tomato, capsicum, knolkhol, cabbage, cauliflower, onion, celery, parsley, lettuce, etc. are usually grown first in seedbeds/portrays and the seeds of cucurbitaceous crops viz., cucumber, bottle gourd, ridge gourd, snake gourd, sponge gourd, pumpkin etc are better first raised in polybags and then seedlings transplanted in main field. The seedling production is a specialized technique requiring more attention, care and management. One should be well versed with the various techniques of nursery raising. Good quality seeds produce healthy, vigorous and productive seedlings under proper management conditions and ultimately lead to abundant yield; almost 20-25% increased yield.

Therefore, the growers, extension professionals and other stake holders need to be equipped with the expertise in seedling raising techniques. An attempt has been made to put together the practical and applied aspects of vegetable nursery management for the benefit of all those who may be interested in refreshing their knowledge and understanding of all the said field techniques. The information contained in this bulletin will be of great help to the farmers/vegetable growers, extension personnels and other stake holders.

In this endeavour, the author duly acknowledges with great reverence the support and encouragement received from the Dr. N.P.Singh, Director, ICAR Research Complex for Goa. I am also thankful to my colleagues, Mr. H.R.C. Prabhu, SMS (PP), Mr. V.Y.Gaonkar, SMS (Hort.), Mr.Sarvesh Desai, RA for giving technical inputs and help and Mr. Vishwajeet Prajapati (Computer Programmer) for taking keen interest in typing designing and composing of this bulletin. I am also thankful to our colleagues, scientists, technical and administrative staff for the cooperation and assistance extended by them.

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(Raj Narayan)

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# 1 Introduction

Nursery is a compact place where seedlings of small and costly seeds are raised for better germination and growth under intensive care. Seedlings of several vegetables need to be first raised in well prepared nursery bed before transplanting them in main field. Nursery management is a very important operation in successful production of vegetable crops, especially in crops which are essentially raised through seedlings in properly managed nursery beds.

Raising the seedlings in nursery beds is an economical, easier and convenient way to nourish and take special care of young, tender seedlings against pest, diseases, weeds, hails, heavy rains, hot sun and other natural hazards. Generally seeds of small seeded vegetable crops such as brinjal, chilli, tomato, capsicum, knolkhol, cabbage, cauliflower, broccoli, lettuce, onion, etc. are first raised in nursery beds, besides the seedlings of cucurbitaceous crops are also raised in poly bags. A few farmers raise potato seedlings in poly bags or small katcha earthen pots to reap advantage of taking early crop to avoid loss due to rain.

***The nursery raising is essential practice owing to the following reasons:***

- It is almost impossible to do direct sowing of small seeds properly.
- The vegetable seeds are generally costly and require better care for good germination and stand.
- Seedlings can be nourished and looked after better and can also be protected well from natural enemies.
- Less expense is involved in management and production.\* Undesirable seedlings can be discarded at the time of transplanting to ensure a quality crop.
- The land can be utilized economically.
- Early and off season seedlings can be raised under protected structures.
- This also provides sufficient time for preparation of main field.

## 2 Types of Nursery Raising

### 2.1 ***Earthen Pots Nursery:***

- The seedlings can be raised in earthen pots.
  - Soil mixture in the ratio of 1:1:1 of soil, sand and well rotten FYM are prepared and filled up in the seedling raising structures.
  - The seeds are to be treated with PSB + *Trichoderma* mixture @ 10g/kg seeds for raising of healthy seedlings. The treated seeds are sown in the pots.
  - Irrigation to be given by water can in initial stage.
- 1-----

- Thereafter the seedlings are irrigated adequately as and when required.
- Necessary control measures are to be taken for pest and disease management.
- The pot mixture combination which have coco-peat, neemcake and trichorich as its principal ingredients is considered good. This mixture combination provides the better germination of seeds during the process of seedling production. A method to protect the seedling during rains is the net house which is simple, cheap and easy to use structure developed on iron frames can also be used.

## 2.2 *Wooden / Plastic Box Nursery*



- Seeds are sown in wooden / plastic boxes of 45 X 35 X 7.5 cm Size with 6-8 properly spaced holes in the bottom and one in centre. Against each of the hole a cork is placed with its concave side down.
- Fill boxes with sieved leaf-mould and sand in the ratio of 1:1.
- The growth media is drenched with water and then with Bavistin @2g/l of water.
- Seeds are sown 1 cm deep and 2 cm apart.
- Cover the boxes with polythene sheet or with paper.

## 2.3 *Protected Nursery*

The seeds are sown under protected structure to raise seedlings and provide protection to them from various natural hazards.

### 2.3.1 *Polythene Bags Nursery:*





### 2.3.1 Polythene Bags Nursery :

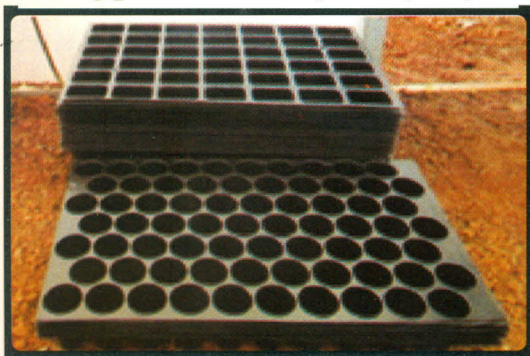


For most of the cucurbits seed propagation and in *situ* sowing is practiced. Seedlings are also grown first in poly bags as described below. This practice is generally used for raising early nurseries of cucurbits.

- Use 100-200 gauge thickness polythene / alkathene bags.
- Fill the polythene bags with a mixture of soil and rotten FYM in equal proportion.
- Before sowing, seeds should be soaked in water for 12-24 hour and then sow 1-2 seeds in each bag.
- Put the bags in protected structures.
- Seedlings are ready for transplanting after 21-25 days at 2-3 true leaf stage.
- Normally the cucurbits do not stand transplanting shock beyond 2-3 true leaf stage due to injury to tap root.
- Firstly remove the polythene bags carefully, see that earthen ball is not broken and then plant with earthen ball into the pit of main field.
- There is considerable saving in seed quantity nearly 50-60% as compared to *in situ* sowing.

### 2.3.2 Plug Tray (Pro trays) Nursery:

Low cost protected structure using shade nets have started vegetable seedling production in portrays by using sterilized coco-peat as growing media.



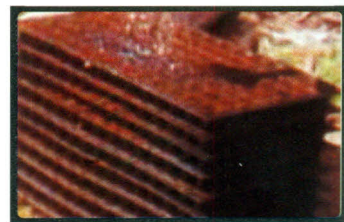
Shade nets would prevent virus causing pests to enter in the structure, the portrays reduce the root damages in seedlings and decrease excess water retention at base. The media which is light in weight would promote excellent germination and growth. As expected, such quality seedlings are very much in demand.

## *The seedling raising techniques in portrays are as follows:*

- The portray (seedlings tray) is to be filled with growing media (coco peat).
- A small depression (0.5 cm) is to be made with finger tip in the center of the cell of the portray to sow the seed.
- One seed per cell to be sown followed by covering of seed with medium
- Coco peat having 300-400% moisture is good to avoid irrigation immediate after sowing and to get better germination and plant stand.



- After sowing, 10 trays can be kept one over other for 3-6 days depending on crop and germination of seed.
- The entire stack should be covered with polythene sheet to ensure consumption of moisture until germination. The stack trays are spread once the germination commences to avoid etiolation.
- The trays are to be shifted to net house on germination of seedlings and spread over the beds with fine sprinkling / rose cane watering.
- The trays are to be irrigated lightly daily depending upon the prevailing weather conditions
- Drench the trays with fungicides as a precautionary measure against the seedlings mortality.
- Spray water soluble fertilizer (0.3%) using poly feed (All with trace elements) twice (12 and 20 days after sowing) to enhance the growth of the seedlings.
- The trays are to be provided with protective cover from rain, hails, etc by covering polythene sheets in the form of low tunnel whenever it rains.
- The seedlings at right stage of planting are to be hardened by withholding irrigation and reducing the shade before transplanting or selling to the growers.



- Spray the systematic insecticides (dimethoate 30 EC – 0.25%, monochrotophos 36 SL 0.03%, Stazem 2: EC-0.25%) at 7-10 days after germination and before transplanting to manage the insect vectors.
- The seedlings would be ready in about 21-25 days for transplanting to the main field except onion which takes about 42-49 days for transplanting.



### 2.3.3

### *Poly Tunnel Nursery for Normal Weather:*



The seeds are sown in the nursery bed covered with the fabricated tunnels of size 3.0m long, 1.5m wide and central height of 1.0m. The semi circular structure is clad with UV polythene sheet (20 micron) with 75% transmittance. Once the seed sowing, covering of seeds and irrigation to field capacity is over, the bed can be covered with the tunnel. Both the ends can also be covered, if nursery is grown in severe winters.

### 2.3.4

### *Sunken Nursery for Weather Extremes:*

- A trench of 1.2 m wide, 45 cm deep and of any length as per convenience and available area is to be prepared.
- Prepare a raised bed of 5-10 cm height at the bottom of the trench. Soil should not be imported from outside in the trench.
- Add well decomposed FYM (25kg), inorganic fertilizer mixture such as Urea (100g), Single Super Phosphate (200g) in 3m<sup>2</sup> area and mix them thoroughly in soil bed.
- Precaution must be taken in applying the FYM. It may be treated with fungicide / *Trichoderma* - 1kg/100kg dung and added at least 15 days prior to bed preparation.
- Thoroughly mix the Muriate of potash (100g ) per 3m<sup>2</sup> area and drench the bed with Thiomethoxam 25EC @ 2-3 ml/l to avoid pest infestation.
- Drench the beds with water to the field capacity of the soil.
- After sowing seed cover the trench with transparent polythene sheet, providing taps to both sides.
- Make the sheet airtight from all the sides.



- Start observing the emergence of seedlings through poly sheet from 10<sup>th</sup> day onwards depending upon crop and climatic conditions prevailing inside the tunnel.
- Once seedlings emergence is over, irrigation may be regulated, as required till the 4 leaf stage is achieved.
- Polythene cover may be removed in sunny days or covered into a roof in rainy days.

## 2.4 ***Raised and Flat Beds:***

For raising healthy nursery in raised / flat beds following protocol is to be adopted.



- Generally 3 m long, 1m wide and 15cm raised nursery beds are recommended for raised bed nursery. However, in case of flat bed nursery, the beds are need not to be raised, these are kept flat only.
- Keep 45-60 cm space between two beds for doing cultural operations easily.
- The nurseries are to be well prepared into a fine tilth.
- Make the bed surface smooth to facilitate proper and uniform watering and to avoid the water accumulation at one place or some spots.
- Firmly press the sides and corners of beds to avoid their erosion during irrigation and heavy rainfall.

## 3. ***Site Selection:***

- The site selected for nursery bed should be safe, open to sun, free from shade, soil borne diseases, pests, weeds, water logging condition and other natural hazards.
- The nursery area should be near to water source.
- Nursery area should have proper drainage facility.
- The nursery area should be well protected from stray cattle and wild animals.



## 4. **Soil Selection:**

- The soil of the site should be fine textured, porous and well drained.
- The soil should be fertile, rich in organic matter with excellent medium for better seed germination and seedling growth.
- Sandy loam to loam soils are ideal for nursery bed; in case heavy soils add coarse sand for better seedlings growth.
- Avoid clayey, saline, highly acidic and alkaline soil for raising the vegetable crop seedlings.
- Slight acidic to neutral soils (pH 6-7) are good for raising seedlings.
- Soil should be able to absorb moisture readily and should not dry quickly.

## 5. **Soil Preparation:**



- Dig the nursery area to a depth of 25-30 cm.
- Mix the basic organic manures and fertilizers in a balanced form.
- The nurseries are to be well prepared into a fine tilth.

### 5.1 **Soil Treatment :**

Soil treatment is a must to reduce the soil borne pathogens, harmful pests and weeds. Following are proven methods of soil treatment.

#### 5.1.1 **Soil Solarization:**

Soil solarization is a cheapest and eco-friendly approach for soil disinfection of nursery beds. For soil solarization dig the soil to a 25-30 cm, moist it and cover with transparent polythene sheet of 50-100 gauge thickness during hot sun. It reduces the soil borne pathogens, harmful pests and weeds to a substantial level.

#### 5.1.2 **Indigenous Soil Treatment :**

The area should be treated indigenously by burning of straw, dry grasses, plant debris or any other locally available material. It is cheap, easy to do and economical.

#### 5.1.3 **Bio Treatments :**

Soil drenching with *Trichoderma viride* solution @ 50g/l water is an eco-friendly method of soil treatment to manage many fungal diseases.



#### 5.1.4 **Chemical Treatment:**

- The chemical treatment can also be done with formalin (1:100) solution in

water applied at 5 lit/m<sup>2</sup> area saturated to a depth of 15 cm and covered thereafter with polythene sheet / gunny bags or tarpaulin for 48 to 72 hours to kill harmful fungi and insects. The beds are uncovered and tilled to allow the formalin to evaporate.

- Mix Chloropyriphos dust and carbofuran / phorate granule @ 5g/m<sup>2</sup> in Soil.
- Drench the soil with Bavistin @ 1g/l water or Dithane M-45 @ 2g/l water or with Blitox or Phytolon @ 3g/l water as a prophylactic treatment against soil borne pathogens.

## 5.2 ***Manuring and Fertilization:***

- Add well decomposed farm yard manure FYM @ 20-25 kg and vermicompost @ 1.5–2.0 kg per bed (3m<sup>2</sup>) uniformly.
- Apply 150-200g Single Super Phosphate, 50-60g Muriate of Potash or 500g 15:15:15 NPK complex fertilizer mixture per bed and mix it well with soil and level the bed uniformly.
- If beds are dry, irrigate the beds for proper decomposition of manures and fertilizers.
- Seed should be sown 5-7 days after application of manures and fertilizers.



## 6. ***Selection and Treatment of Seed:***



- Preferably use quality, certified or foundation, seed for raising the seedlings.
- Only healthy and vigorous seeds to be selected for sowing.
- Seeds should be free from weed and other crop / varieties seeds.
- Seeds should be purchased from reliable source preferably from public sector / research / authentic seed production organizations.

### 6.1 ***Seed Treatment:***

- Treated seeds to be used to avoid soil borne disease infestation.
- Seed should be treated with Bavistin / Dithane M-45 at 2g/kg seed.
- Seed treatment with *Trichoderma viride* powder at the rate of 10g/kg of seed is an eco – friendly way to manage fungal diseases. If *Trichoderma* is used the chemicals should not be used.





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## Irrigation:



- Water the beds immediately after covering the beds with watercane / rosecane.
- Water the sown bed daily in the morning and evening in coastal climate during summers and winters till seedlings are ready for transplanting. However, during the winter season of northern area only one irrigation in a day is sufficient.

- Avoid excessive watering.

9

## After care:



- Nursery bed should be checked regularly for appearance of diseases, pests and any other physical problem / deficiency symptoms.
- Irrigate beds with 0.5% urea or 1.0% CAN solution at an interval of 15-20 days in early stages of seedlings in order to accelerate the seedling growth.
- Spray urea at 0.1 to 0.2%, If seedlings show poor growth.
- Pulverize the soil surface and eradicate the weeds as they appear.
- Protect against pests and diseases by spraying the nursery with pesticides Bavistin or Calxin at 0.1%, Diltane M-45 at 0.2% or Sevin at 1ml/l water or Rogor / Melathion at 0.01% as and when necessary.
- Drenching the plants with *Trichoderma viride* solution @ 50g/l water is an effective bio control measure to manage fungal diseases. It should not be applied with the chemical pesticides.
- Sometimes starter solution prepared from vermicompost farm yard manure / cowdung or dilute solution of fertilizer can also be applied in the nursery beds or transplanted seedlings. It should be applied in the soil @ 25ml / plant and should never be applied where basal fertilizers have already been added as the over dose of nutrients may kill the tender seedlings / plants.



• The use of shade and agro nets are effective in raising seedlings during high temperature and high rainfall. Shade reduces temperature by 5-10°C and harmful effects of high temperature. Similarly, agro nets protect the seedlings from infestation and damage by other insects.

## 12 **Seedlings Treatments :**

Dip the seedlings in the solution of 0.25% Dithane M-45 and 0.05% Bavistin for 5 minutes. Root dip treatment with *Trichoderma viride* solution at 20g/l water for 15-20 minutes is also good for managing the soil borne fungal diseases. The chemical treatment is not to be given, if seedlings are dipped in *Trichoderma* solution.

### 12.1 **Dipping roots of seedlings in a starter solution:**

- A starter solution is a weak solution of fertilizers mixture (0.5%) containing N, P and K. It is given to seedlings as root dip (10 mins) before transplanting or as soil drench at the time of transplanting.
- Starter solution's treatment is given in order to supplement the nutritional



requirement of the plants. It is useful, since the root contact with the soil is disturbed while transplanting for sometime.\* Seedlings can also be dipped in *Trichoderma viride* @ 20g/l for 15-20 min to supplement the nutritional requirements of the plants. It is useful since the root contact with the soil is distributed while transplanting.

## 13 **Transplanting:**

- Avoid too old and too young seedlings and select only healthy and uniform seedlings for transplanting.
- Always transplant the seedlings in the main field at proper spacing during evening hours.
- Seedlings can be transplanted bare root or with soil ball containing roots. Bare rooted seedlings undergo root damage and transplanting shock and will check the growth.
- Use of starter solution containing N, P and K or growth regulators after transplanting proves beneficial in the establishment of seedlings in the field.
- Fix the plant well in the main field and water them daily till they establish well in the field.



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## 14 *Points to be pondered:*

- Use healthy vigorous seeds having better germinability, treat the seeds with recommended pesticides to check disease and pest infestation.
- Do not sow soaked seeds in dry soil.
- Do not soak seeds in hot water for more than recommended temperature and duration.
- Do not store seeds after soaking.
- Use well decomposed organic manures and compost
- Disinfect the beds against soil borne pathogens and pests with recommended chemical / treatment.
- Sow the seeds preferably in 15 cm raised bed instead of flat bed.
- Seed may be sown shallower in the spring when the ground tends to be moist and deeper in summer when the soil is usually dry. In no case the seed should be sown more than 2 cm deep.
- Sow the seeds in line, 5 cm apart thinly to avoid over crowding.
- Cover the sown bed with clean dry grass leaves, paddy straw, polythene sheet or gunny bags till seeds start germination.
- Avoid covering the seed bed with clayey and alkaline soil.
- Irrigate the beds daily once in morning and once in evening with the help of watercane till they are ready for transplanting.
- Always give light irrigation and avoid excessive watering and do not allow the water accumulation / stagnation.
- Remove the covering when seeds have germinated.
- Save the seedlings from sun scorching, chilly winds and heavy rainfall by providing shade whenever necessary.
- In case damping off or wilt diseases spray seedlings with 0.25% Dithane M-45 and 0.05% Bavistin.
- Maintain 25-30 seedlings per meter rows by keeping 3-5 cm plant spacing by removing weak, damaged and diseased plants.
- Never force the plant by heavy fertilization, watering and over crowding.
- After 4-6 weeks, plants become 10-15 cm tall and will be ready for transplanting.
- Stop irrigation or gradually reduce watering for hardening of the seedlings.
- Always raise 20% more seedlings.

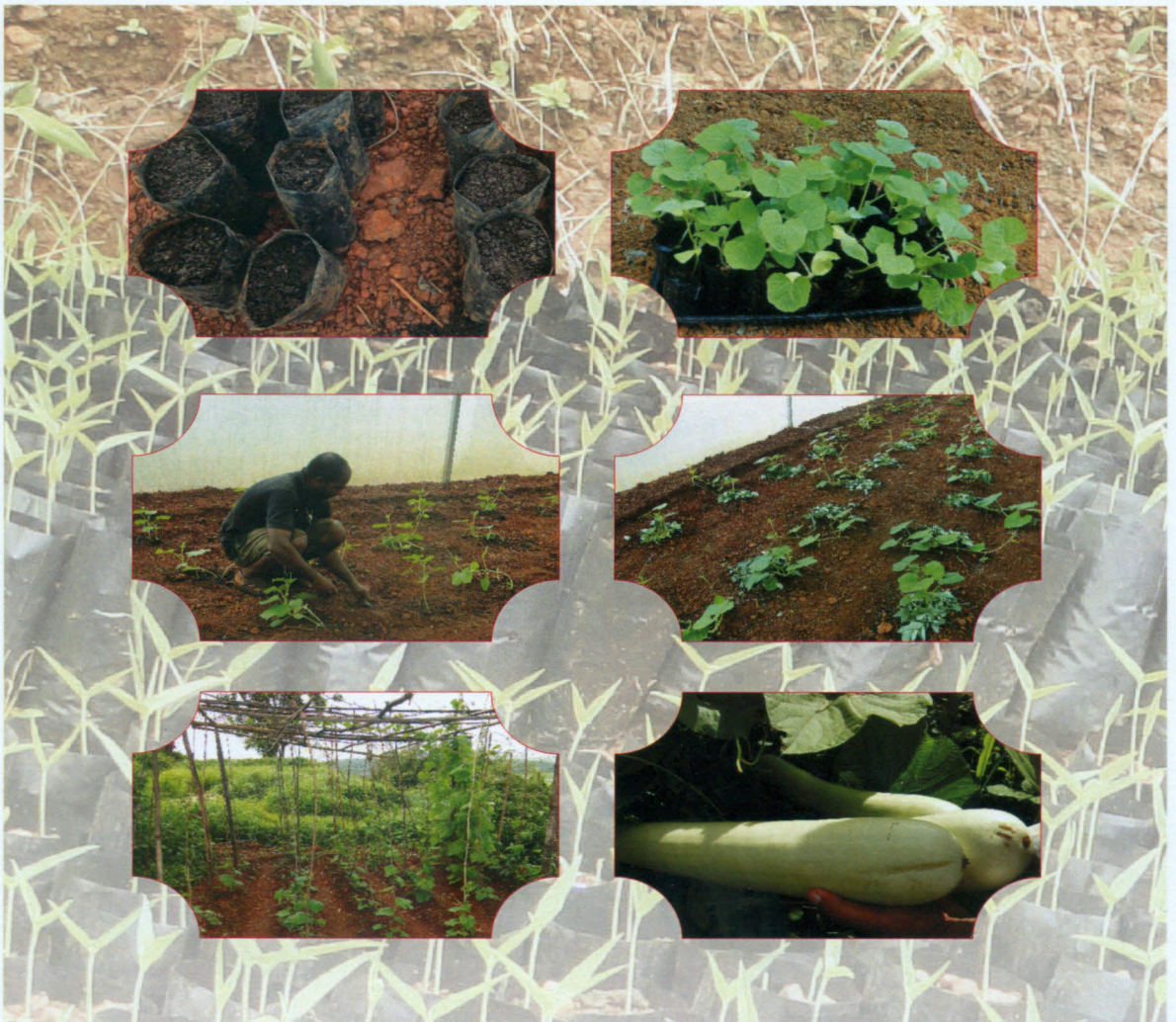
- Apply ample water to the nursery bed before pulling out the seedlings in order to reduce root injury.
- Do not place the seedlings in direct sunlight after uprooting.
- Keep the reserve seedlings in shade or moist substrate.
- After uprooting and just before transplanting dip the seedlings in recommended solutions / formulation to avoid pest, disease attack and for proper establishment and growth of seedlings in main field.
- Press the soil in such a way that the roots come in well contact with soil and prevent the air pockets near the roots by pressing the soil around plant gently.
- While transplanting the seedlings maintain natural position of roots in the soil as far as possible. Never remove leaves or any portion of leaves from the seedlings.
- Uproot seedlings as per requirement and complete the transplanting as quickly as possible on the same day of uprooting the seedlings.
- Transplanting should be done during evening hours except in cloudy days.
- Irrigation water must be arranged well before transplanting and must be applied soon after the transplanting. Onion is an exception where water requirement is less in the beginning.
- Gap filling must be followed at the earliest to maintain plant population.
- Attack of insect, pest and diseases may be checked regularly and adopt precautionary and control measures well before they spread throughout field.
- The spray pumps, pesticides, etc. should be arranged well in advance.

## **15                    *Conclusion:***

Raising the healthy nursery is a specialized technology which requires knowledge and skill about various nursery raising techniques and scientific management of nurseries. The advent of different nursery techniques has opened the new vistas for growing healthy vegetable crops in any part of the year and irrespective of any vegetable crop. Such innovative techniques are facilitating the growers in producing off season vegetable crops for getting high yield and fetching remunerative returns. The young and tender plants are well nourished and protected in nursery area which in turn facilitate better seed germination and healthy seedlings production resulting ultimately in reduced seed rate and improved yield and quality.

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